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Soil organic components distribution in a podzol and the possible relations with the biological soil activities

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ABSTRACT

This research reports the preliminary results of a study based on the SOC (Soil Organic Carbon) fractionation in a pine forest soil (Pinus nigra). Hyperskeletic Albic Podzol soil (P113005, World Reference Base, 2014), described by the following sequence O-Ah-E-Bh-Bs-Cg, was investigated at Zoniën, Belgium. Total (TOC) and extractable (TEC) soil contents were determined by Italian official method of soil analysis. Different soil C fractions were also determined: Humic Acid Carbon (HAC) and Fulvic Acid Carbon (FAC). Not Humic Carbon (NHC) and Humin Carbon (Huc) fractions were obtained by difference. Along the mineral soil profile, therefore, were also tested some enzymatic activities, such as cellulase, xylanase, laccase and peroxidase, involved in the degradation of the main organic substance components, and dehydrogenase activity, like soil microbial biomass index.

The results shows a differential TEC fractions distribution in the soil profile along three fronts of progress: (i) An E leaching horizon of TEC; Bh horizon (humic) of humic acids preferential accumulation, morphologically and analytically recognizable, in which humic are more insoluble that fulvic acids, and predominate over the latter; (ii) horizon Bs (spodic) in which fulvic acids are more soluble that humic acid, and predominate in their turn.

All enzyme activities appear to be highest in the most superficial part of the mineral profile and decrease towards the deeper layers with different patterns. It is known that the enzymes production in a soil profile reflects the organic substrates availability, which in turn influences the density and the composition of the microbial population. The deeper soil horizons contain microbial communities adapted and specialized to their environment and, therefore, different from those present on the surface

The results suggest that the fractionation technique of TEC is appropriate to interpret the podsolisation phenomenon that is the preferential distribution of the different fractions of the SOC. It can form the base study for evaluation of changes in some biological activity along soil profile.